

REMARKS

Claims 1-4, 6 and 7 are all the claims pending in the application. Claim 4 is amended.

2. With regard to U.S.C.102 and 103 rejections:

(1) Feature of the present invention;

The feature of the present invention will be explained as follows, as recited in the present claim 1.

At a first-stage process, the glass substrate is chemically strengthened by the use of a first alkali ion having a first ion radius greater than a smallest ion radius of a smallest alkali ion among the alkali ions contained in the glass substrate so as to produce compression stress on a surface of the glass substrate and to produce tensile stress in a depth of the glass substrate.

At a second-stage process, the glass substrate is chemically strengthened by the use of a second alkali ion having a second ion radius greater than the first ion radius of the first alkali ion so as to increase the compression stress of the surface of the glass substrate and to reduce the tensile stress of the depth of the glass substrate.

By such a specific two-stage process, it is possible to manufacture the glass substrate for the magnetic disk, which is high in transverse strength and is prevented from damage or breakage with time.

(2) Combination of the Takahashi and Aratani;

As mentioned above, the feature of the present invention is to control the stress profile by the specific two-stage process. Combination of Takahashi and Aratani fails to teach the feature of the present invention. Detail discussion will be made hereinafter.

Generally speaking, when the chemical strengthening process is carried out by a two-stage process, a second-stage process is performed under stricter condition than a first-stage process. Consequently, both compression stress and tensile stress in the second-stage process are largely different from those in the first-stage process.

Specifically, if the second-stage process is simply performed so as to have higher strength than the first-stage process, the compression stress of the surface of the glass substrate is increased and the tensile stress of the depth of the glass substrate is increased also. In other words, both compression stress and tensile stress are inevitably increased in the second-stage

process.

By contrast, according to the present invention, the second-stage process is carried out so as to increase the compression stress of the surface of the glass substrate and to reduce the tensile stress of the depth of the glass substrate in order to manufacture the substrate suitable as the glass substrate for the magnetic disk. Thus, according to the present invention, both compression stress and tensile stress are not increased in the second-stage process

This is because the property as the substrate for the magnetic disk is taken into consideration.

From this viewpoint, if Takahashi and Aratani are simply combined to perform the chemical strengthening process of the two-stage process, in the second stage-process, the compression stress of the surface of the glass substrate is increased and the tensile stress of the depth of the glass substrate is increased also. Therefore, the combination of Takahashi and Aratani fails to control the stress profile of the present invention, i.e., the second-stage process is carried out so as to increase the compression stress of the surface of the glass substrate and to reduce the tensile stress of the depth of the glass substrate.

In order to further clarify the feature of the present invention, description will be made of differences of the stress profiles between the present invention and Aratani with reference to the attached reference figures 1 to 3. Herein, the stress profiles of the reference figures 1 to 3 are observed with respect to the cross section of the substrate by the use of Babinet compensation method.

The reference figure 1 shows the stress profile at the first stage-process of the present invention. The reference figure 2 shows the stress profile at the second stage-process of the present invention.

As shown in reference figure 2, at the second-stage process, the glass substrate is chemically strengthened by the use of a second alkali ion having a second ion radius greater than the first ion radius of the first alkali ion so as to increase the compression stress of the surface of the glass substrate and to reduce the tensile stress of the depth of the glass substrate.

On the other hand, the reference figure 3 shows the stress profile in the first and second stage-processes of Aratani. As shown in reference figure 3, the stress profile at the first stage-process of Aratani may be same as that of the present invention. However, the stress profile at the

second stage-process of Aratani is clearly different from that of the present invention. Specifically, as shown in the reference figure 3, both of the compression stress and the tensile stress are increased at the second stage-process. In other words, in Aratani, the value of the tensile stress is increased with the increased value of the compression stress. Consequently, the tensile stress becomes large so that the self-breakage may occur.

By contrast, according to the present invention, the value of the tensile stress is reduced so that the value of the compression stress is increased. Thus, the stress profile is balanced according to the present invention. Consequently, the self-breakage does not occur.

Accordingly, the combination of Takahashi and Aratani fails to teach the feature of the present invention, i.e., the second-stage process is carried out so as to increase the compression stress of the surface of the glass substrate and to reduce the tensile stress of the depth of the glass substrate.

Thus, the present invention is clearly patentable over the combination of Takahashi and Aratani.

Continued Examination Under 37 CFR 1.114

In the Office Action dated November 1, 2007, the Examiner states that “the request for a continued prosecution application (CPA) under 37 CFR 1.53(d) filed on [1] is acknowledged.” The Examiner goes on to state that “Since a CPA of this application is not permitted under 37 CFR 1.53(d)(1), the improper request for a CPA is being treated as a request for continued examination of this application under 37 CFR 1.114.” The basis for and intent of this comment is not understood by Applicants.

Applicants filed a USPTO form entitled “Request for Continued Examination (RCE) Transmittal” that requested entry of the Amendment dated August 02, 2007. It is not understood by Applicants how this can be interpreted as a request for a CPA.

The Examiner’s comment and explanation of the basis for the Examiner’s comment is respectfully requested so that such misinterpretation by Applicant would not occur again.

Claim Objections

Claims 4 and 7 are objected to because Applicant did not appropriately annotated the subject matter additions and/or deletions from the amended claim. Appropriate correction is required.

First, Applicant wishes to express appreciation for the Examiner's diligence in identifying the claim changes that were erroneously specified by the Applicant and, unfortunately, not caught by the Applicant's representatives. Applicant apologizes for the error.

Second, Applicant is not sure of the proper remedy for the error since the amendment appears to have been entered and no Notice of Non-Compliance was issued. Nonetheless, Applicants have presented claim 4 with the amendment notations that should have been presented in the previous Amendment on August 02, 2007. If this is improper, Applicants respectfully request the Examiner to identify the appropriate manner for correcting the error.

Third, with respect to claim 7, it is assumed that the claim is objectionable only due to its dependence from claim 4. With the removal of the error from claim 4, the objection to claim 7 also should be removed.

Claim Rejections - 35 USC § 102

Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Aratani (US 4,671,814). This rejection is traversed for at least the following reasons.

The rejection of claims 1 and 2 as being anticipated by Aratani is a new rejection, based on the Examiner's reconsideration of the teachings of the reference, as the reference previously was applied against the claims only in combination with Takahashi. As demonstrated subsequently, the reference does not teach each and every limitation of the claims and, thus, the rejection for anticipation should be withdrawn.

Aratani

The Examiner asserts that Aratani teaches a method for strengthening a glass substrate having a thickness of about 1.0 mm by chemical strengthening, specifically based on Example 1 (Column 8, Lines 39-53). The Examiner further asserts that Aratani discloses a two step process wherein a glass substrate is initially processed with a first alkali ion of a first molten salt containing sodium nitrate (first step) and followed with a subsequent treatment using a second alkali ion of a second molten salt containing potassium nitrate (second step). The Examiner

asserts that the claimed effect upon compressive stress at the surface of the substrate and tensile stress at an interior depth of the substrate are understood implicitly to follow from the disclosed process.

First, Applicants respectfully submit that the standard applied by the Examiner, namely “implicitly to follow” is not an appropriate standard for anticipation. Such standard only applies to obviousness. Thus, on its face, the rejection is improper and inconsistent and should be withdrawn.

Second, the applicable case law does permit anticipation where a feature is “inherent.” A single prior art reference anticipates a patent claim if it expressly or inherently describes each and every limitation set forth in the patent claim. Verdegaal Bros., Inc. v. Union Oil Co., 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). However, the threshold for meeting the standard for inherency is high. Inherent anticipation requires that the missing descriptive material is “necessarily present,” not merely probably or possibly present, in the prior art. In re Robertson, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999) (citing Continental Can Co. USA, Inc. v. Monsanto Co., 948 F.2d 1264, 1268, 20 USPQ2d 1746, 1749 (Fed. Cir. 1991)).

As demonstrated subsequently, this standard is not met by Aratani as Applicant has identified two opposite structures, one in Aratani and one taught by the present Applicants that preclude the feature from being “necessarily present.” Indeed, since the structure of Applicant’s invention is so different from that of Aratani and the conventional art, it is not obvious.

Claim 1

Generally speaking, when the chemical strengthening process is carried out by a two-stage process, a second-stage process is performed under stricter condition than a first-stage process. Consequently, both compression stress and tensile stress in the second-stage process are significantly different from those in the first-stage process.

Specifically, if the second-stage process is simply performed so as to have higher strength than the first-stage process, the compression stress of the surface of the glass substrate is increased and the tensile stress of the depth of the glass substrate also is increased. In other words, **both** compression stress and tensile stress are inevitably **increased** in the second-stage process.

By contrast, according to the present invention, as expressly stated in claim 1, the second-stage process is carried out so as to increase the compression stress of the surface of the glass substrate and to reduce the tensile stress of the depth of the glass substrate in order to manufacture the substrate suitable as a glass substrate for a magnetic disk. Thus, according to the present invention, **both** compression stress and tensile stress are not increased in the second-stage process

This is because the property as the substrate for the magnetic disk is taken into consideration.

Aratani does not teach or suggest such two stage process, since **both** compression stress and tensile strength are **increased** by the disclosed approach, as cited by the Examiner.

Since the stress limitations are expressly stated in the rejected claim, and since the stress limitations are not expressly taught in Aratani nor inherent, the claim cannot be anticipated.

Claim 2

This claim would be patentable for reasons given for claim 1.

Claim Rejections - 35 USC § 103

Claims 1-3 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (US 6,119,483) in view of Aratani (US 4,671,814). This rejection is traversed for at least the following reasons.

Claim 1

As mentioned above, the feature of the present invention as defined in independent claim 1 is to control the stress profile by the specific two-stage process. The combination of Takahashi and Aratani fails to teach the feature of the present invention, specifically the stress limitations where a second step **increases** the compression stress and **reduces** the tensile stress, as demonstrated in the following detail discussion.

Aratani

The Aratani reference has been discussed previously and the same comments apply to distinguish the claims over the teachings of the reference.

Takahashi

Takahashi merely teaches a method for processing a glass substrate for use as a magnetic disk. Takahashi does not teach or suggest the modification of Aratani to employ a two step

process where the compression stress is **increased** and the tensile stress is **reduced**.

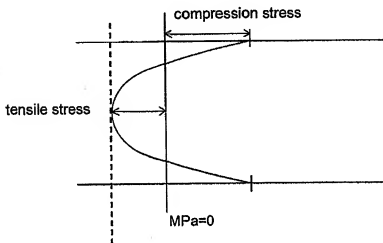
Specifically, if Takahashi and Aratani are combined to perform the chemical strengthening process of the two-stage process, in the second stage-process, the compression stress of the surface of the glass substrate is **increased** and the tensile stress of the depth of the glass substrate is **increased** as well. Since **both** tensile stress and compression stress are **increased**, the combination of Takahashi and Aratani necessarily fails to control the stress profile in the manner of the present invention, i.e., the second-stage process is carried out so as to **increase** the compression stress of the surface of the glass substrate and to **reduce** the tensile stress of the depth of the glass substrate.

Thus, if Takahashi and Aratani are simply combined to perform the chemical strengthening process of the two-stage process, in the second stage-process, the compression stress of the surface of the glass substrate is increased and the tensile stress of the depth of the glass substrate is increased also. Therefore, the combination of Takahashi and Aratani fails to control the stress profile of the present invention, i.e., the second-stage process is carried out so as to increase the compression stress of the surface of the glass substrate and to reduce the tensile stress of the depth of the glass substrate.

In order to further clarify the feature of the present invention, Applicants respectfully refer the Examiner to differences of the stress profiles between the present invention and Aratani with reference to the attached reference figures 1 to 3. Herein, the stress profiles of the reference figures 1 to 3 are observed with respect to the cross section of the substrate by the use of Babinet compensation method.

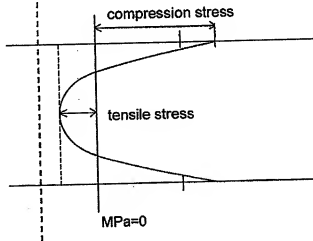
The reference figure 1, illustrated below, shows the stress profile at the first stage-process of the present invention.

REFERENCE FIGURE 1 (1ST STAGE)



The reference figure 2, illustrated below, shows the stress profile at the second stage-process of the present invention.

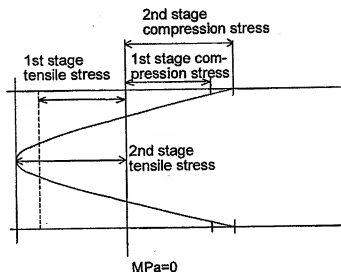
REFERENCE FIGURE 2 (2ND STAGE)



As shown above in reference figure 2, at the second-stage process, the glass substrate is chemically strengthened by the use of a second alkali ion having a second ion radius greater than the first ion radius of the first alkali ion so as to **increase** the compression stress of the surface of the glass substrate and to **reduce** the tensile stress of the depth of the glass substrate.

On the other hand, the below reference figure 3 shows the stress profile in the first and second stage-processes of Aratani.

REFERENCE FIGURE 3



As shown above in reference figure 3, the stress profile at the first stage-process of Aratani may be same as that of the present invention. However, the stress profile at the second stage-process of Aratani is clearly different from that of the present invention. Specifically, as shown in the reference figure 3, both of the compression stress and the tensile stress are increased at the second stage-process. In other words, in Aratani, the value of the tensile stress is increased with the increased value of the compression stress. Consequently, the tensile stress becomes large so that the self-breakage may occur.

By contrast, according to the present invention, the value of the tensile stress is **reduced** so that the value of the compression stress is **increased**. Thus, the stress profile is balanced according to the present invention. Consequently, the self-breakage does not occur.

There is nothing in Takahashi that would teach or suggest that the tensile stress should be reduced. At best, Takahashi would suggest the conventional approach of increasing tensile stress. Thus no reference cited by the Examiner teaches what Applicants have claimed.

In the Response to Arguments, the Examiner asserts that the references cannot be attacked individually. This is not the basis for Applicants' attack. To the contrary, it is that NO REFERENCE teaches what Applicants have claimed. Indeed, the thrust of the prior art is in the

opposite direction (increasing both compression stress and tensile stress), as explained above. Under the USPTO Guidelines post KSR, this feature clearly supports a conclusion that the invention is not obvious.

In sum, the combination of Takahashi and Aratani fails to teach the feature of the present invention, i.e., the second-stage process is carried out so as to increase the compression stress of the surface of the glass substrate and to reduce the tensile stress of the depth of the glass

In view of the above, the present invention as defined in claim 1 is clearly patentable over the combination of Takahashi and Aratani.

Claims 2, 3 and 6

These claims would be patentable for the reasons given for parent claim 1.

Claims 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi (US 6,119,483) and Aratani (US 4,671,814) as applied to claim 1 above and in further view of Morehouse (US 5,379,171). This rejection is traversed for at least the following reasons.

The Examiner asserts that Takahashi and Aratani teach every element of claim 1. This has been demonstrated to be incorrect, in the above discussion as there is no teaching in either or both references that the tensile stress is reduced in the second stage..

The Examiner admits that neither of the cited references explicitly teaches the use of a glass substrate within the claimed thickness ranges.

Morehouse et al

The Examiner looks to Morehouse et. al. solely for a teaching of the detailed construction of a magnetic hard drive device. Indeed, the Examiner asserts with respect to the disk substrate, that Morehouse teaches that (Column 43, lines 35-47);

"Magnetic recording disk 10 comprises a thin film surface, with coercivity greater than 1500 Oe, coated with materials such as Co--Ni or Co--Cr--Ta alloys, applied to both sides of a rigid substrate by methods such as RF sputtering or plating. The substrate used with magnetic recording disk 10 is preferably about 0.445 mm thick, with very flat, smooth, surfaces and with good mechanical rigidity. Examples of suitable substrate materials are aluminum alloys, glass and ceramic materials." (emphasis added)

Clearly, the Examiner does not rely upon the Morehouse reference to remedy the deficiencies of Aratani and Takahashi. Indeed, nothing in the reference would lead one of ordinary skill to modify the combined teachings of Aratani and Takahashi in developing a material that has **increased** compression stress but **reduced** tensile stress, as claimed. In the absence of such teaching, the art clearly draws one skilled in the art away from the invention and without a teaching of each claim limitation in any of the cited art, the invention is neither anticipated nor obvious.

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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